

Attracting Tomorrow



# $\mu$ POL<sup>TM</sup> Technology FS1406, User Guide

$P_{Vin}=12V, V_o=2.5V@6A$

# User Guide for FS1406 Evaluation Board

-This board facilitates the evaluation of the FS1406  $\mu$ POL<sup>®</sup>. The Output voltage is 2.5V, up to 6A from input voltages 12V.

**-PVin: J1, input for 12V (+)**

**-Gnd: J2, Input for 12V (-)**

**-Vout: J8, Output (+)**

**-Vout: J7, Output (-)**

# User Guide for FS1406 Evaluation Board

## -Board Features:

- $V_{in} = +12V$
- $V_o = 2.5V$
- $I_o = 0A - 6A$
- $F_s = 2.8 \text{ MHz}$
- $C_o = 2 \times 10\mu F \text{ MLCC}$
- $C_{in} = 2 \times 22\mu F \text{ MLCC}$
- 6A load output under ambient temperature  $70^\circ C$

## Connection and Operating Instruction

- A well regulated +12V input supply should be connected to PVIN (**J1**) and GND (**J2**).
- A maximum of 6A load should be connected to VOUT(**J8**) and GND (**J7**). The inputs and output connections of the board are listed in Table I.
- FS1406 is configured for only one input supply and internal LDO generates Internal Supply (Vcc) from PVin.
- There is a divider from PVin to Enable which ensures that proper sequencing is followed.

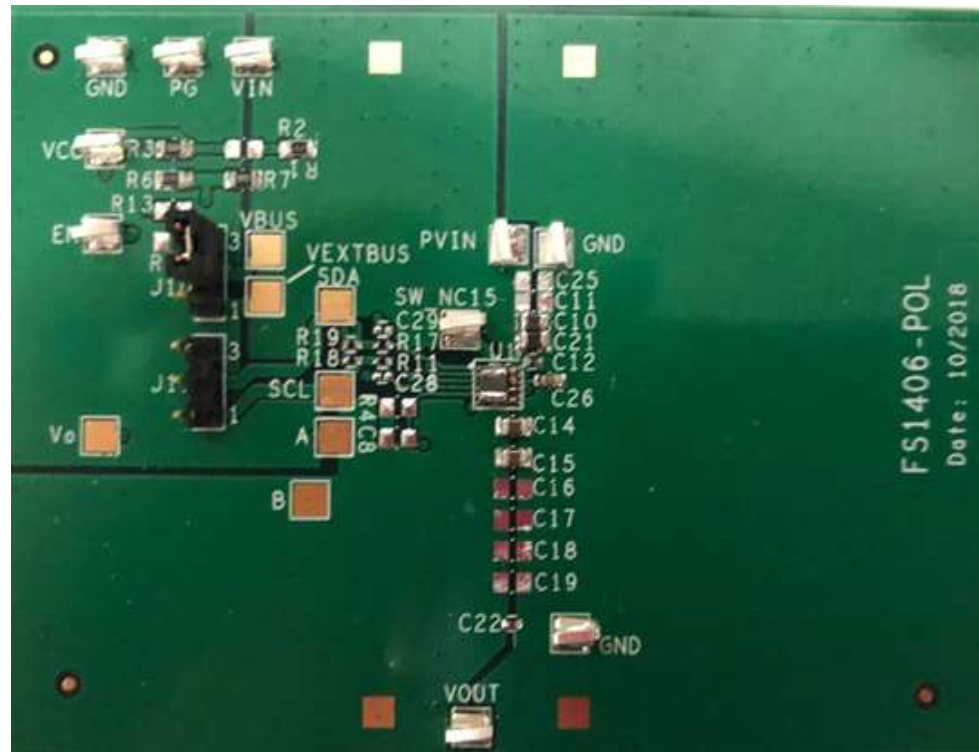
## Table I, Connection

Connection	Signal Name
Pvin (J1)	Input Supply (12V)
GND (J2)	Ground connection for Input Supply
VOOUT(J8)	Vo (2.5V)
GND (J7)	Ground connection for output
Vcc (TP2)	Vcc / LDO output
GND (TP3)	Ground for Vcc
EN (TP11)	Enable
PG (TP12)	Power Good

# Layout

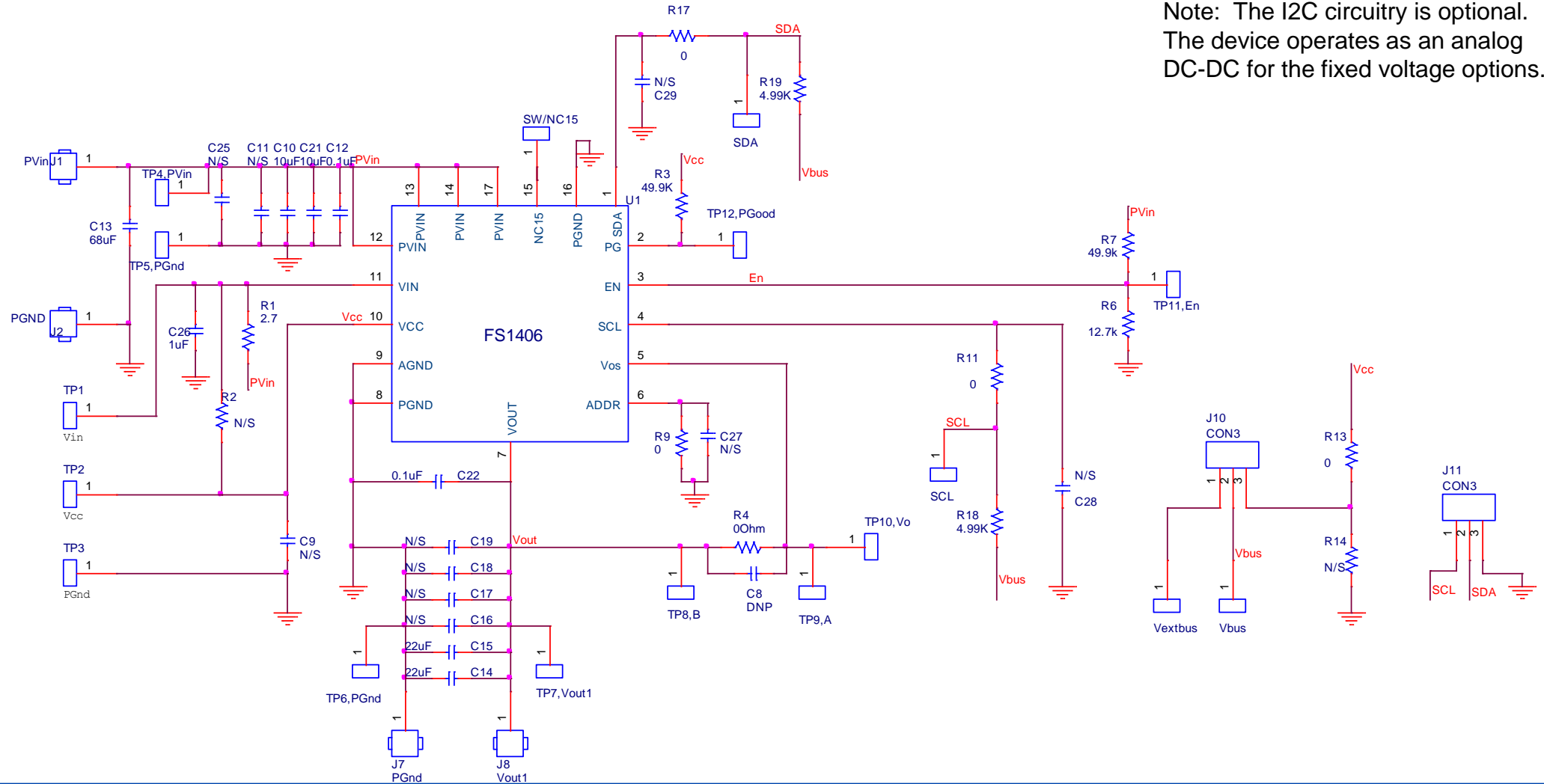
The PCB is a 4-layer board (63mmx84mm) using FR4 material. All layers use 2 Oz. copper. The PCB thickness is 1.5mm. The FS1406 and other major power components are mounted on the top side of the board.

# Connection Diagram



- The Board is configured so it can start up by applying only 12V supply.
- Enable is connected to PVIN via a resistor divider, thus no need to apply Enable signal.

# Schematic



Note: The I2C circuitry is optional.  
The device operates as an analog DC-DC for the fixed voltage options.

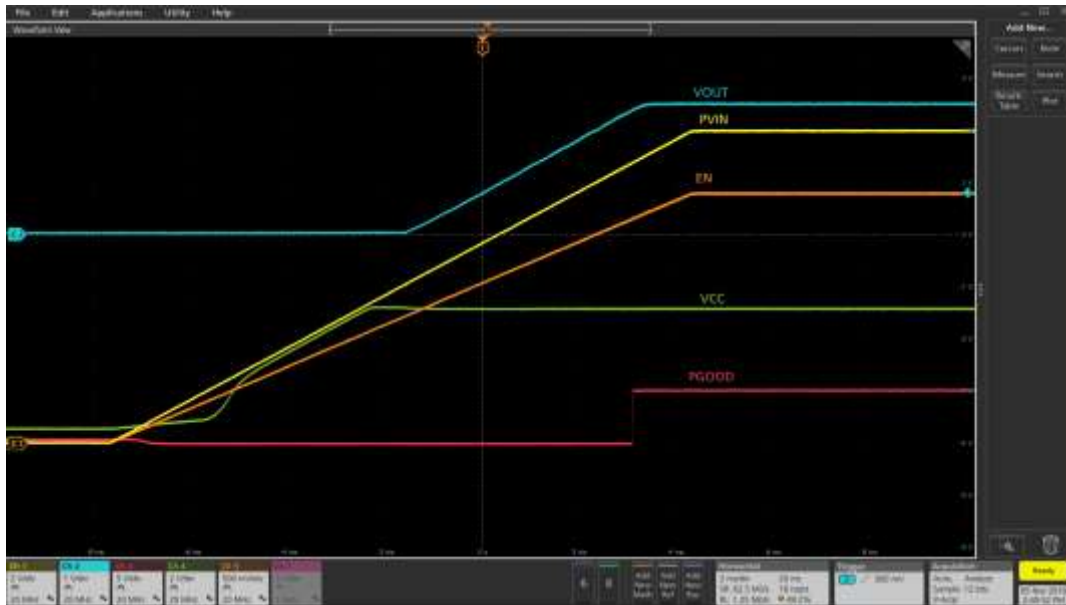


# BOM

Part reference	Qty	Value	Description
FS1406 POL	1		Main IC
C13	1	68uF	25V
C14,C15	2	22uF	0805, 6.3V, X7S
C12,C22	2	0.1uF	0402, 16V, X7R
C10, C21	2	10uF	0805, 16V, X7R
R1	1	2.7 Ohm	10%, 1/8W, 0805 case size
R3,R7	2	49.9K	10%, 1/8W, 0805 case size
C26	1	1uF	0603,25V, X7R
R18,R19	2	4.99K	0402 case size
R6	1	12.7K	10%, 1/8W, 0805 case size
R4, R9, R13, R11, R17	5	0 Ohm	0402 case size
TP1-TP12, Sw/NC15, Vbus, Vextbus, SCL, SDA	17		Test Point
J1	1	RED	Banana Connector
J2,J7	2	Black	Banana Connector
J8	1	Green	Banana Connector
J10, J11	2		3 pin header

# Typical Operating Waveforms

PVin=12.0V, Vo=2.5V, Io=0-6A, Room Temperature, no airflow



**Start Up @ 0A**

**Ch 1: PVin Ch2: Vo Ch3: PGood Ch4: Vcc, Ch 5: En**

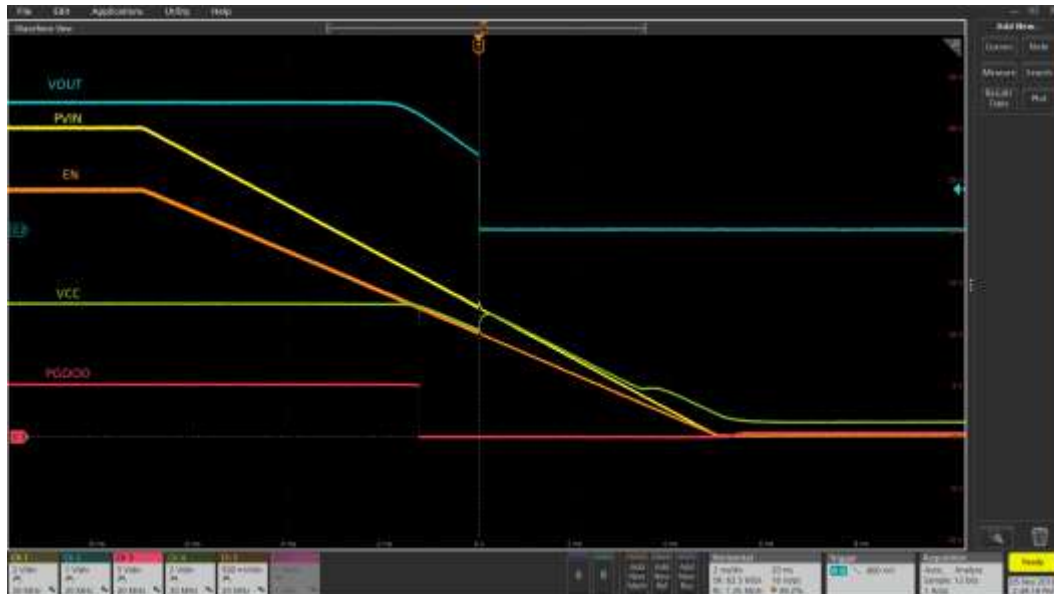


**Start Up @ 6A**

**Ch 1: PVin Ch2: Vo Ch3: PGood Ch4: Vcc, Ch 5: En**

# Typical Operating Waveforms

PVin=12.0V, Vo=2.5V, Io=0-6A, Room Temperature, no airflow



**Shutdown at 6A with Enable**

Ch 1: PVin Ch2: Vo Ch3: PGood Ch4: Vcc, Ch 5: En



**Soft turn off @ 6A**

Ch 1: PVin Ch2: Vo Ch3: PGood Ch4: Vcc, Ch 5: En

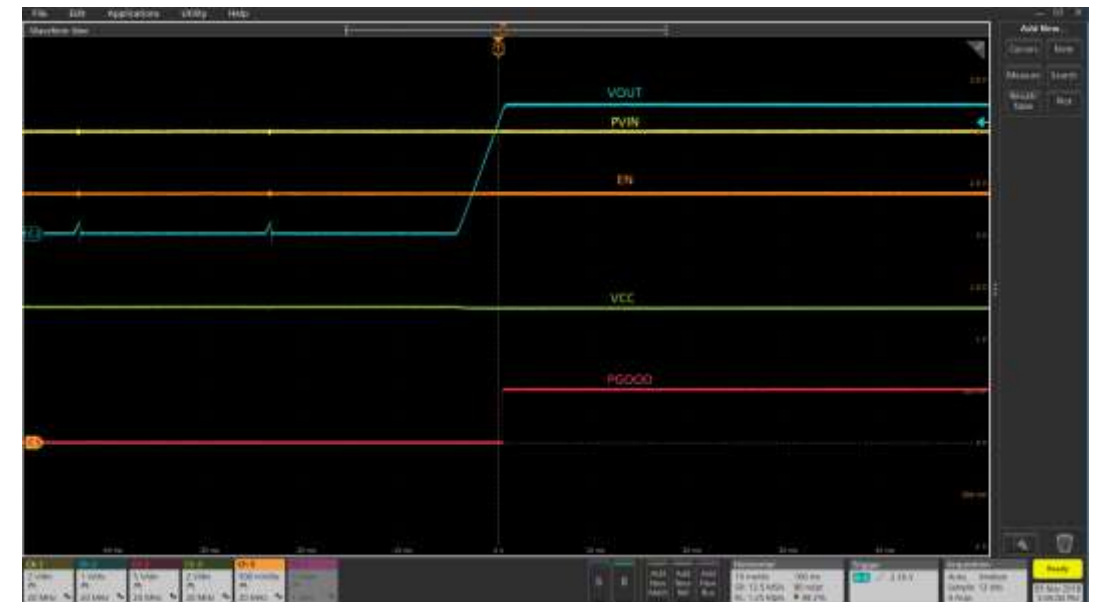
# Typical Operating Waveforms

PVin=12.0V, Vo=2.5V, Io=0-6A, Room Temperature, no airflow



**Startup into prebias**

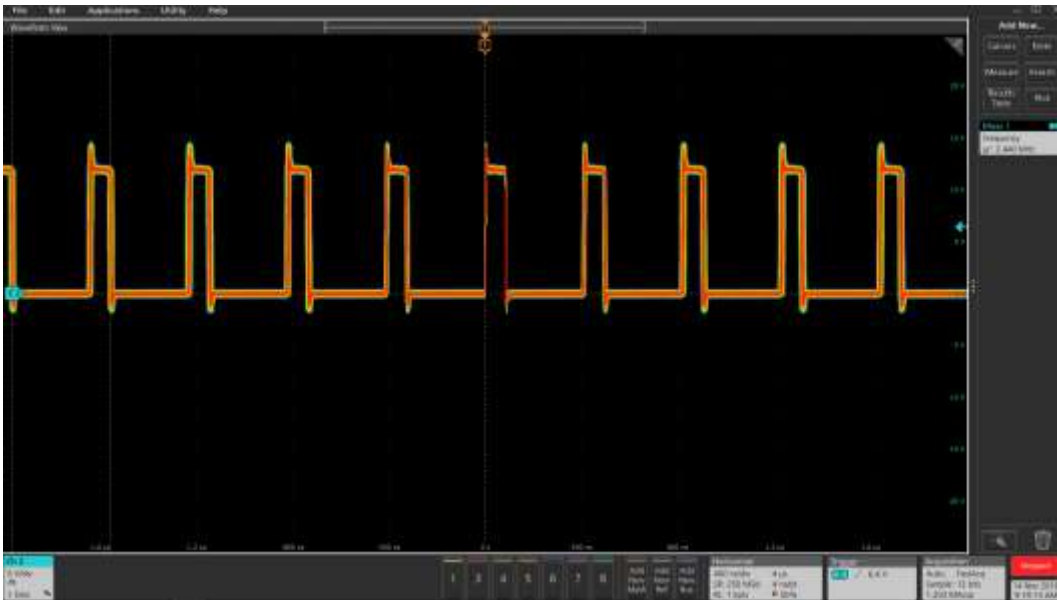
**Ch 1: PVin Ch2: Vo Ch3: PGood Ch4: Vcc, Ch 5: En**



**Over Current Protection and Auto Recover to 6A**  
**Ch 1: PVin Ch2: Vo Ch3: PGood Ch4: Vcc, Ch 5: En**

# Typical Operating Waveforms

PVin=12.0V, Vo=2.5V, Io=0-6A, Room Temperature, no airflow



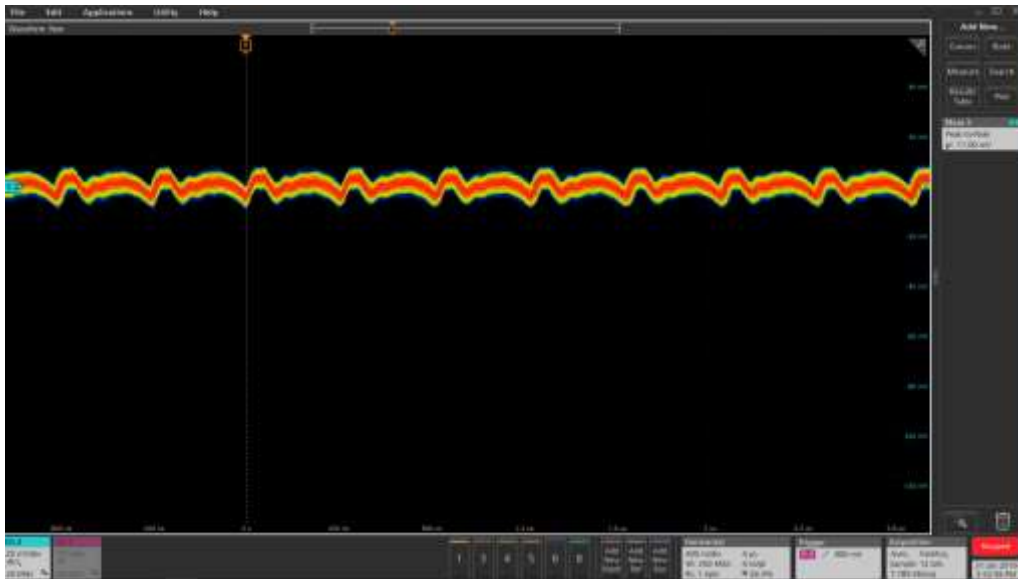
**SW@0A**  
**Ch 2: SW**



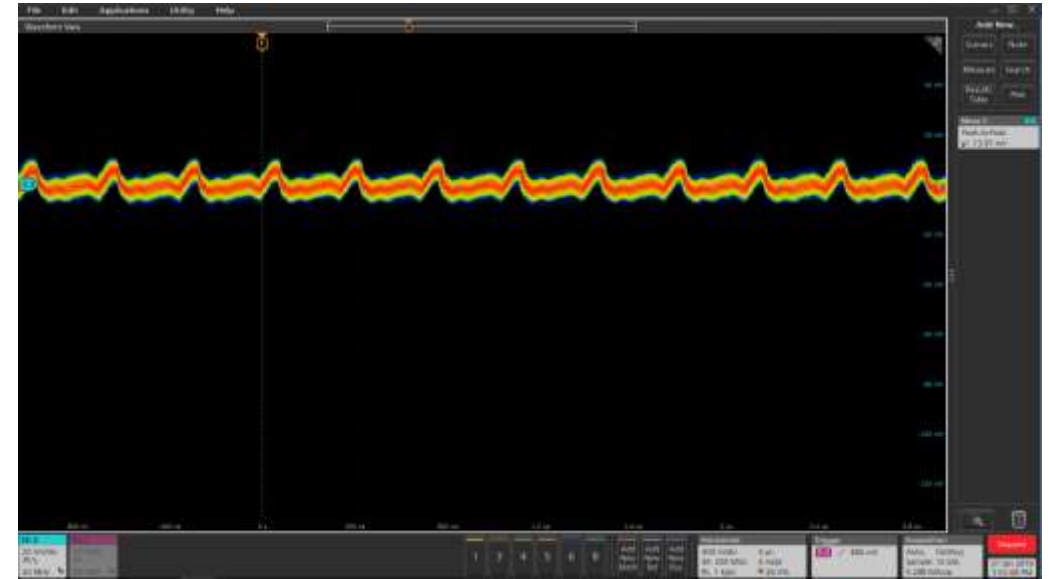
**SW@6A**  
**Ch 2: SW**

# Typical Operating Waveforms

PVin=12.0V, Vo=2.5V, Io=0-6A, Room Temperature, no airflow



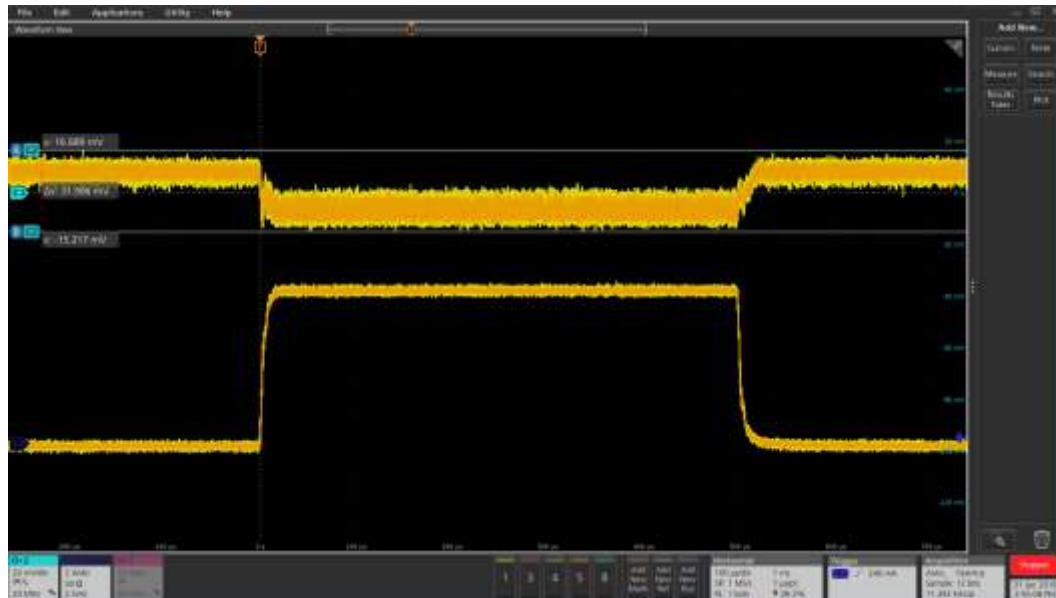
**Vo ripple 11 mV @ 0 A**  
Ch2: Vo



**Vo ripple 14mV @ 6 A**  
Ch2: Vo

# Typical Operating Waveforms

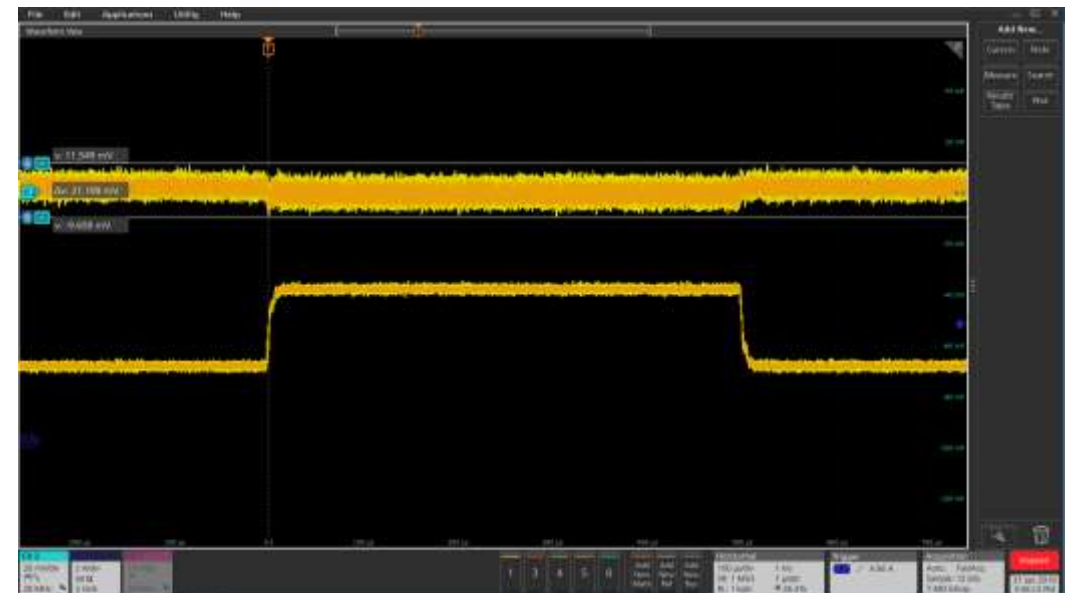
$P_{Vin}=12.0V$ ,  $V_o=2.5V$ ,  $I_o=0-6A$ , Room Temperature, no airflow



**Load transient 0A-6A**

**Ch6:  $I_o$  Ch2:  $V_o$**

$V_o$  (p-p)=32mV



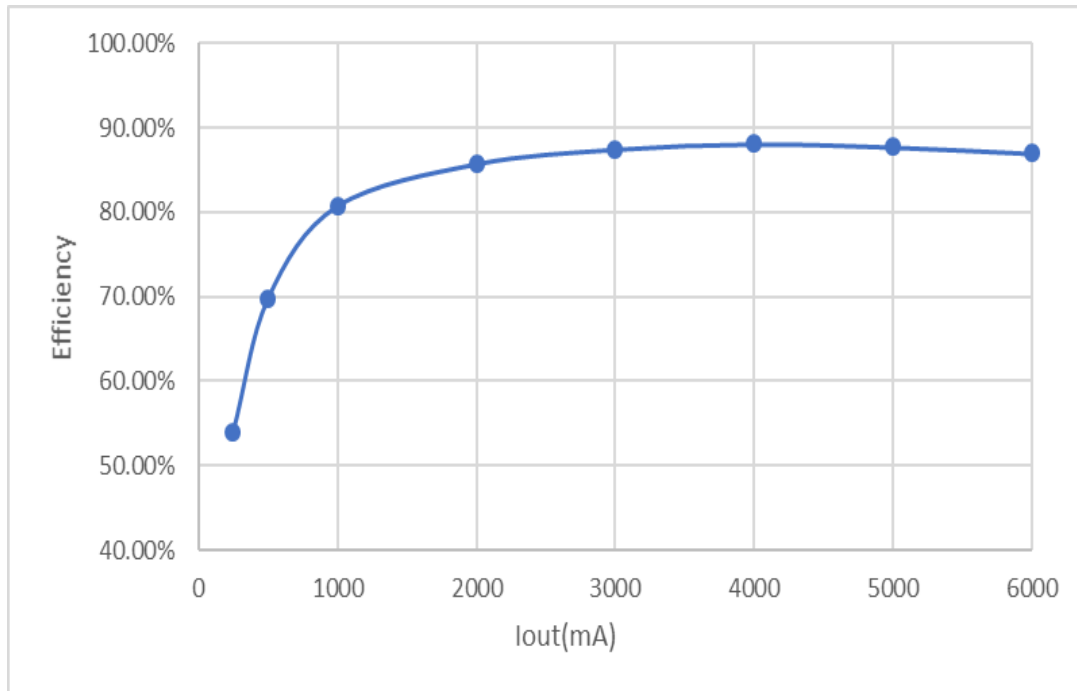
**Load transient 3A-6A**

**Ch6:  $I_o$  Ch2:  $V_o$**

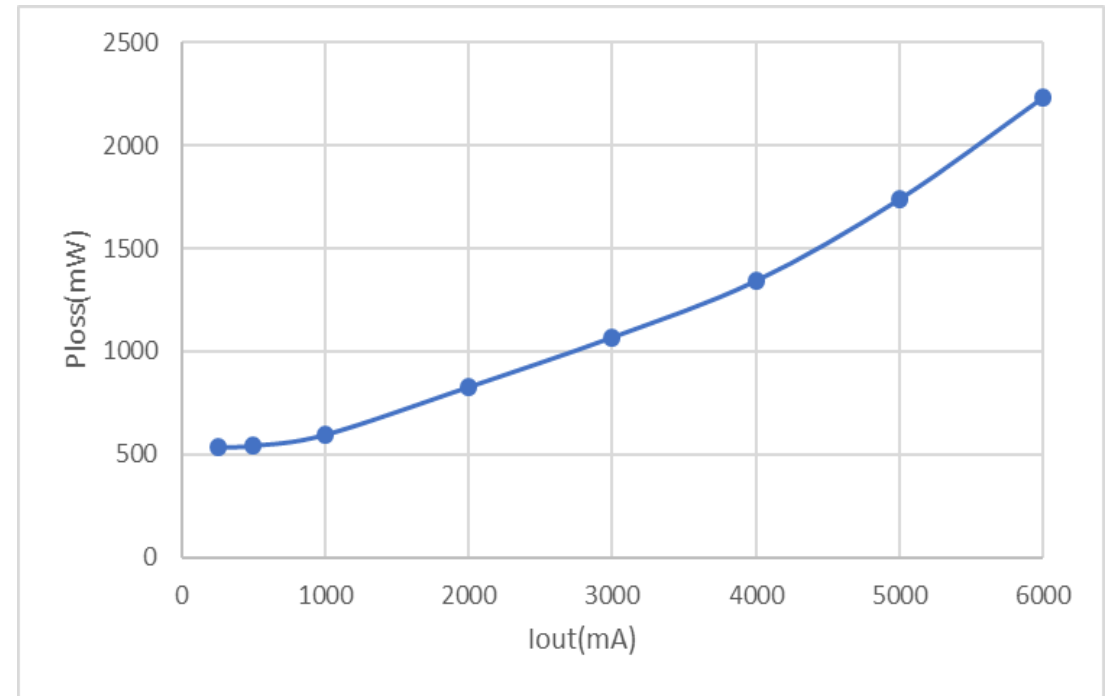
$V_o$  (p-p)=22mV

# Typical Operating Waveforms

$P_{Vin}=12.0V$ ,  $V_o=2.5V$ ,  $I_o=0-6A$ , Room Temperature, no airflow



Efficiency

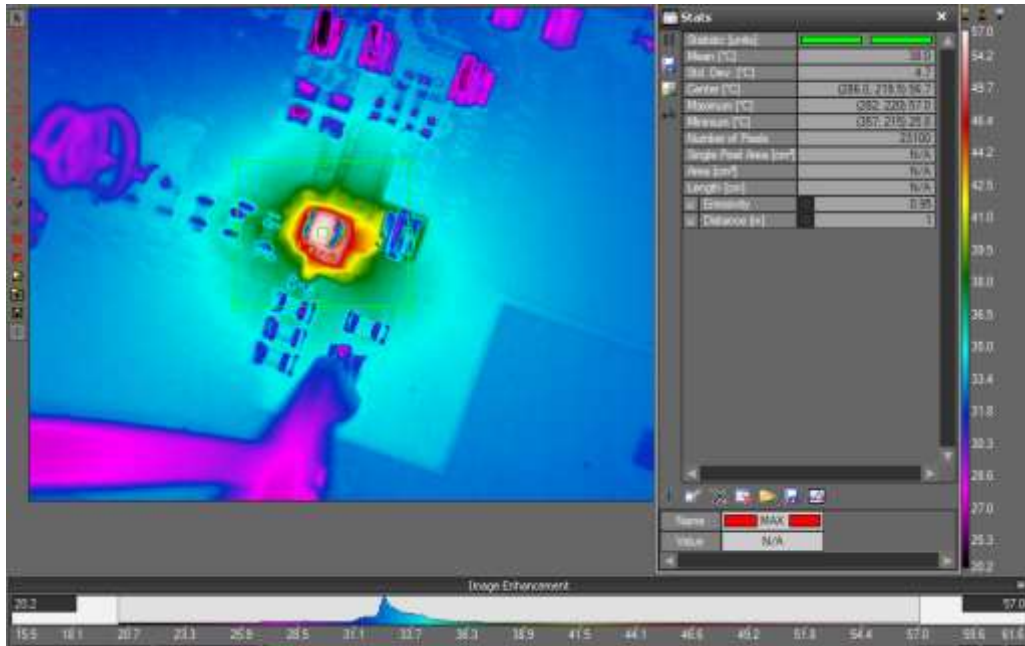


Power Loss

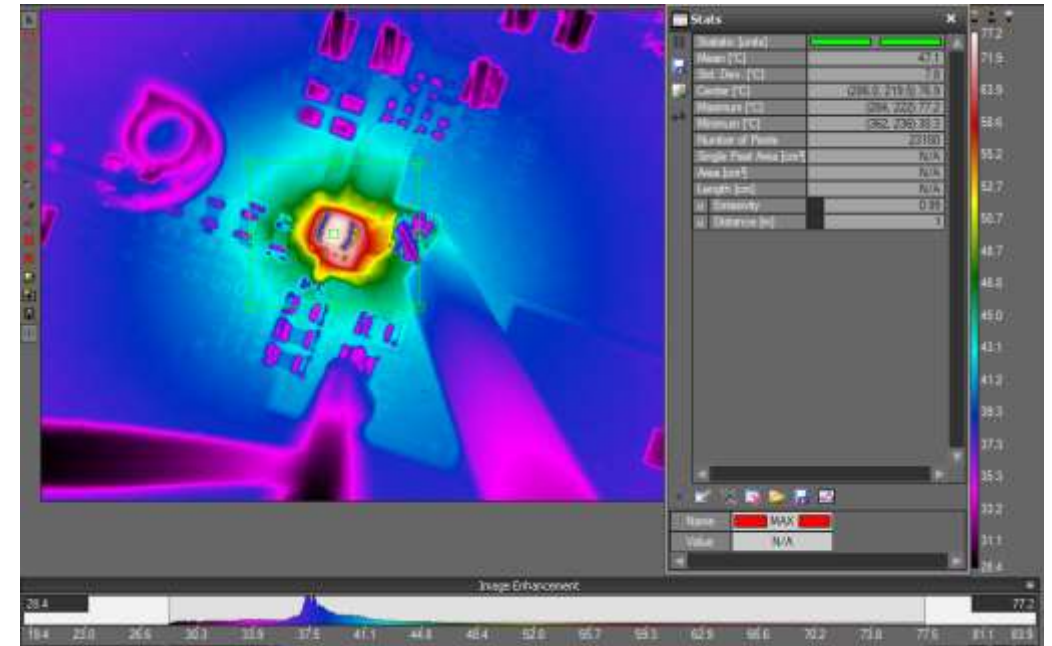


# Typical Operating Waveforms

PVin=12.0V, Vo=2.5V, Io=0-6A, Room Temperature, no airflow



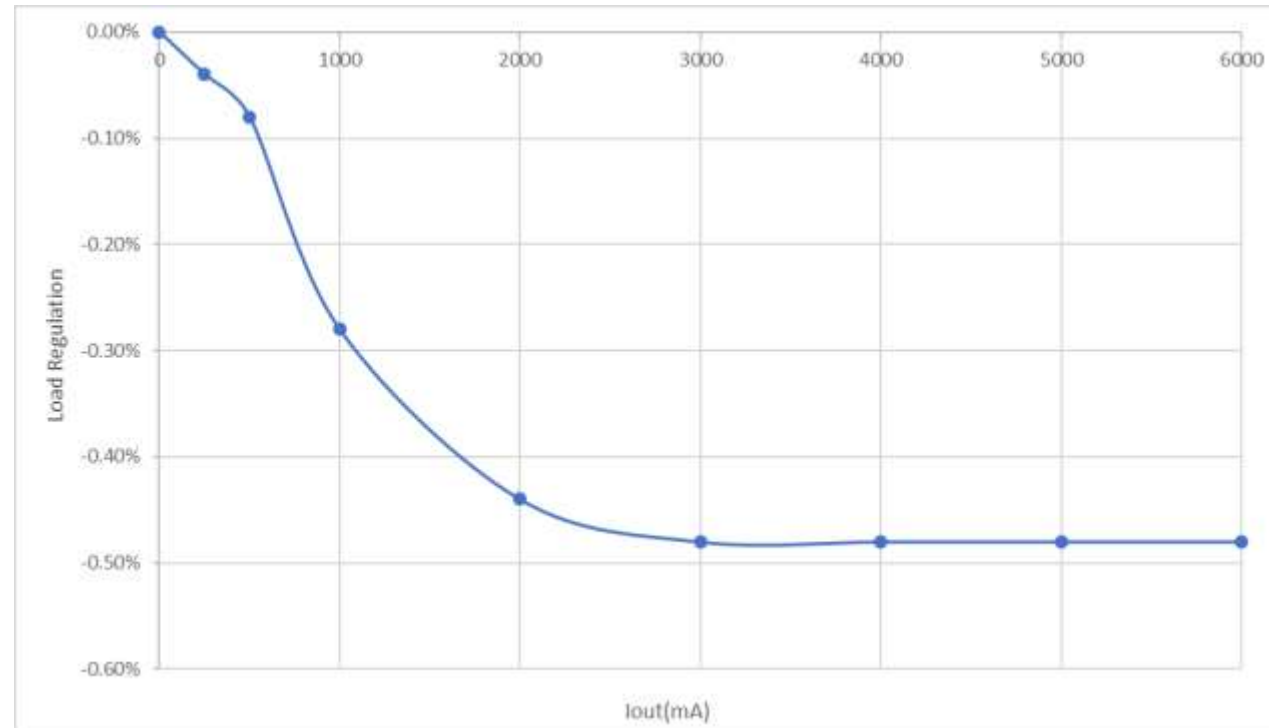
**Io=4A DC**  
**Inductor Temperature Rise 32°C**



**Io=6A DC**  
**Inductor Temperature Rise 53°C**

# Typical Operating Waveforms

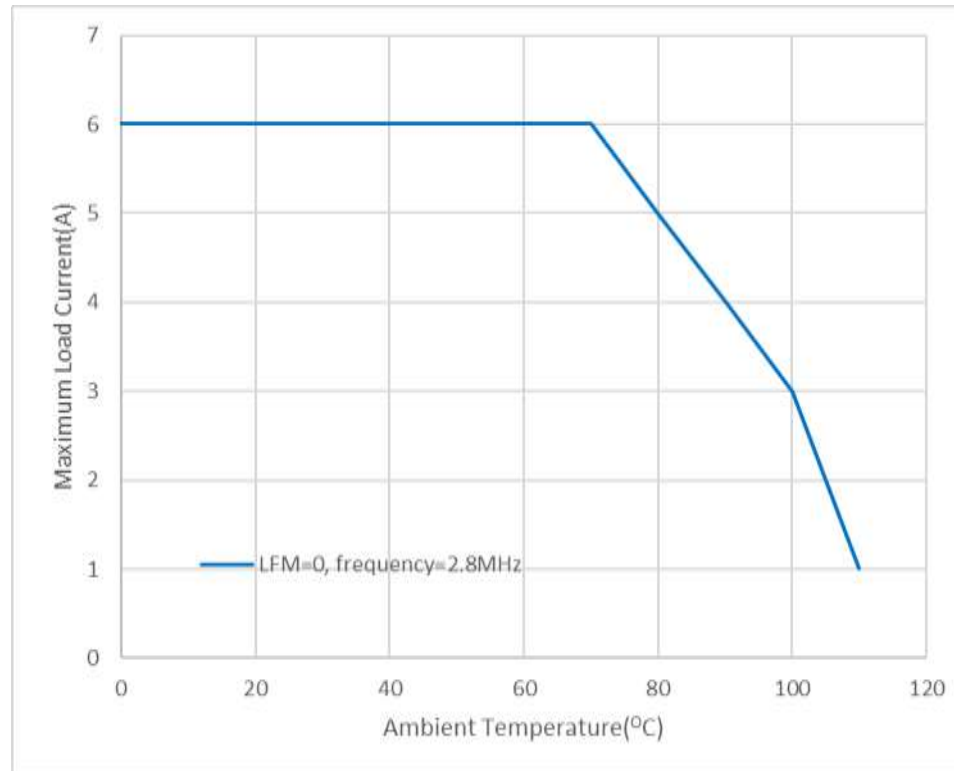
$P_{Vin}=12.0V$ ,  $V_o=2.5V$ ,  $I_o=0-6A$ , Room Temperature, no airflow



**$I_o=0A-6A$   
Load Regulation**

# Typical Operating Waveforms

PVin=12.0V, Vo=2.5V, Io=0-6A, Ambient Temperature from 0°C to 110°C, no airflow



**Derating, VIN=12V, VOUT=2.5V,  
FS1406 Demo Board**

# Disclaimer

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